HAZARDOUS MATERIAL PROTECTION

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8.1 Introduction

The purpose of this chapter is to describe the key elements of the WIPP hazardous material protection program most important to the safety basis. It summarizes provisions for hazardous material protection other than radiological hazards and summarizes the hazardous materials concerns. The elements of this chapter include:

- An overall description of the hazardous material protection policy and program
- A summary of the hazardous material exposure control program
- Information on the hazardous material communication program

8.2 Requirements

The standards, regulations, and DOE Orders required for establishing the safety basis of the facility, specific to the hazardous materials program include the following:

- 29 CFR Parts 1900-1999, Occupational Safety and Health Act[1]
- 29 CFR Parts 1926.1, "Safety and Health Regulations for Construction"[2]
- 10 CFR Part 850, “Chronic Beryllium Disease Prevention Program”[3]
- DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*[4]
- DOE Order 450.1A, *Environmental Protection Program*[5]
- DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards*[6]

8.3 Hazardous Material Protection and Organization

Hazardous material protection is an integral part of the WIPP industrial safety program (WP 12-IS.01-1, Industrial Safety Program - Structure and Management),[7] and WP 12-IH.02, WIPP Industrial Hygiene Program Manual - Overview.[9] The organization responsible for implementation is the WIPP Industrial Safety and Hygiene (IS&H) section. Implementation of the defined program elements controls occupational health hazards originating from chemical, biological, and physical (excluding ionizing radiation) agents. WP 12-IH.02-4, Hazard Communication & Hazardous Material Management Plan[10] is used to control the acquisition (requisition and procurement), use, handling, and storage of non-radiological waste hazardous materials and chemicals. Protection of personnel from radiological material falls under the radiation protection program discussed in Chapter 7 of this documented safety analysis (DSA).

The hazardous material program is established to protect human health and the environment by controlling chemical hazards. This program defines the scope of chemical covered and provides direction and references to analyze the hazards that are inherent in their storage and use. It describes the processes and systems used for self-performed work and by subcontractors for their activities to control chemical hazards to protect personnel, the public, and the environment.

The organizational structure and responsibilities delegated by the WTS General Manager for IS&H is discussed in Chapter 17 of this DSA. In addition, the following functions are assigned to IS&H:

- Chemical safety
- Industrial hygiene
- Fire prevention, protection, and control
- Medical examinations, diagnosis, treatment, and preventive medicine
- Safety training

WP 12-IH.02[9] identifies the qualifications and positions of authority and responsibilities of the IS&H organization. IS&H liaisons with other safety organizations, and facility operations is discussed in WP 12-IH.02.[9]

8.4 ALARA Policy and Program

The hazardous materials exposure control program at the WIPP seeks to ensure that employee exposures to hazardous materials are minimized and maintained beneath levels of regulatory toxicological concern. The as low as reasonably achievable (ALARA) program (WIPP ALARA Program Manual, WP 12-2)[11] ensures that employee exposure to radioactive material is ALARA. The programs evaluate potential hazards for radioactive, chemical, physical, and biological agents and ergonomic stressors using DOE requirements, and Occupational Safety and Health Act (OSHA),[1] National Institute for Safety and Health, and U.S. Environmental Protection Agency (EPA) exposure assessment methodologies. The following controls are used to keep the hazardous materials exposures ALARA:

- Using approved and controlled procedures that provide administrative or engineering controls that minimize or eliminate exposure to hazardous materials
- Furnishing employees the necessary personal protective equipment (PPE) and training on the proper use of PPE
- Training employees to recognize potential hazards, take safety precautions, understand consequences of an accident, and know the actions to take in case of an accident
- Monitoring the work environment to obtain personnel and area exposure data
- Reviewing and approving all chemical use and storage at the WIPP
- Maintaining Material Safety Data Sheets (MSDSs)

8.5 Hazardous Material Training

WP 12-IH.02-4[10] requires hazards communication training be provided to the WIPP personnel through the General Employee Training (GET) and GET refresher instructions. This training covers the topics required by 29 CFR §1910.1200, "Hazard Communication,"[12] as well as site-specific policies and procedures, including access to on-line MSDS databases. Information about new site hazards and changes in applicable policies or procedures is provided to employees in the annual GET refresher training.

Personnel who sample for hazardous constituents or who are responsible for management of hazardous waste receive training as a hazardous waste worker. Sampling personnel also must complete a qualification card.

Job-specific hazard communication training for chemical hazards is provided through pre-job briefings and on-the-job instruction involving management and employees.

8.6 Hazardous Material Exposure Control

WP 12-IH.02[9] encompasses the comprehensive aspects of industrial hygiene defined by DOE Order 440.1A,[4] excluding ionizing radiation, physical safety, fire prevention, medical examinations, and formal training, which are addressed by other industrial hygiene programs. Hazardous materials and chemicals are controlled through a combination of engineered controls, administrative controls, and PPE.

WP 12-IH.02[9] protects the WIPP workers by anticipating, recognizing, evaluating, and controlling chemical, physical, biological, and ergonomic factors and/or stressors in the workplace. The permissible exposure limits used in hazard evaluation and hazard communication shall not exceed those in the mandatory standards of DOE Order 440.1A.[4]

Industrial Safety and Health personnel conduct surveys to ensure the adequacy of controls to ensure adequacy of controls. Procedures provide guidance for on-site handling and disposal of waste materials, including chemically contaminated waste, personnel monitoring when necessary or requested, establish PPE requirements, and job site sampling and monitoring when required.

WP 12-IH.02-9, WIPP Industrial Hygiene Program - Beryllium Exposure Prevention Program,[8] has been developed as some of the TRU waste forms being disposed of at the WIPP include beryllium. No activities at WIPP involve direct handling of beryllium as part of normal operations. The program identifies the controls necessary for worker protection from beryllium in the event that a waste container is breached. In general, since beryllium may be in the waste, the controls that provide radiological protection also provide protection from beryllium.

8.6.1 Hazardous Material Identification Program

WP 12-IH.02,[9] and implementing procedures, ensure the proper management of material hazards by establishing procedural and programmatic controls for hazardous materials procurement. Restricted materials are identified that require written IS&H/Site Environmental Compliance management approval prior to purchase. Receipt inspection is conducted as appropriate to ensure control of hazardous materials throughout the site. Chemicals purchased for use are reviewed for their associated hazards. Where feasible, less hazardous materials are selected. Once received, hazardous materials are inventoried and traced until they are used or disposed. A Hazardous Materials Area Representative (HMAR) maintains inventory lists of the hazardous materials used in areas of their responsibility. An MSDS is maintained for each chemical. The MSDS provides chemical-specific information including chemical name, manufacturer, physical properties, chemical properties, reactivity, and fire suppression information.

Workers are trained annually through GET in the ways to obtain MSDS information, including paper or electronic copies, and how to interpret them. Employees receive annual Hazardous Waste Worker if handling hazardous chemicals is specific to their work assignment. Workers also receive information specific to the hazards and conditions of their specific work area.

When work is to be performed by a subcontractor, the subcontractor's safety and health program is required by WP 12-IH.02-4[10] to address hazardous and toxic materials brought on-site by the contractor. The subcontractor must provide MSDSs for these chemicals, and the chemicals are entered into a centralized list.

8.6.2 Administrative Limits

The industrial hygiene monitoring program for evaluating employee exposures to potential chemical, physical, biological, and ergonomic health hazards ensures that the personnel exposure to hazardous material does not exceed those in the mandatory standards in DOE Order 440.1A.[4]

8.6.3 Occupational Medical Programs

The occupational medical site personnel, as defined in WP 15-HS.02, Occupational Health Program Plan,[13] work in cooperation with other WIPP site organizations to optimize the maintenance of a healthful work environment. Preemployment, periodic, return-to-work, and termination health examinations are coordinated through the WIPP Human Resources Department. Diagnosis and treatment of occupational injuries and illnesses are coordinated with the WIPP organizations where these incidents may occur. Health maintenance and preventive medical activities are coordinated with IS&H.

As part of the program, the WIPP employs a part time occupational medical physician. The physician is assisted by an on-site occupational health nurse and emergency service technicians. The emergency service technicians provide 24-hour emergency medical coverage on the site.

The occupational medical program is designed to accomplish the following:

- Ensure the health and safety of employees in their work environments, through the application of occupational health principles.
- Determine the physical fitness of employees to perform job assignments without undue hazard to themselves, fellow employees, or the public at large.
- Ensure the early detection and treatment of employee occupational illness, or injuries, by means of scheduled periodic health evaluations and a wellness awareness program.
- Provide employees, as appropriate, with medical evaluations, guidance, counseling, and referrals to specialists in support of physical and mental health. This includes assisting the Occupational Medical Director as defined in WP 15-HS.02[13] with the planning, implementation, and administration of the Employee Assistance Program and the Alcohol/Substance Abuse Rehabilitation Program.
- Maintain confidentiality of employee medical records.
- Maintain employee exposure and medical records in accordance with 29 CFR §1910.1020, "Access to Employee Exposure Medical Records,"[14] and document exposures to hazardous chemicals

8.6.4 Respiratory Protection

WP 12-IH.02[9] defines the WIPP respiratory protection program as part of the WIPP's Integrated Safety Management Program (MP 1.28, Integrated Safety Management).[15] WP-IH.02-6, Respiratory Protection,[16] specifies the program responsibilities, training and qualification requirements for respirator wearers and managers, and the requirements for selection and issuance of respirators. The program provides compliance with OSHA and MSHA respiratory protection regulations. Training is provided before initial use and every subsequent year for general respiratory use. Elements of the respiratory protection program required for radiological protection include the following:

- Explanation of why respiratory protection is required
- Nature, extent, and effects of respiratory hazards in the workplace
- Explanation of available engineering and administrative controls
- Explanation of why a particular type of respirator has been selected for a specific respiratory hazard
- Description of hazards typically encountered and the respiratory equipment provided for the individual's job category
- Explanation of the operations, capabilities, and limitations of the respirator selected
- Instruction and individual participation in inspecting, donning, performing a user seal check, wearing, and doffing a respirator
- Instruction in proper issuance of respirators
- Maintenance and storage of respirators
- Instruction for verifying that the labeling and color-coding of filtering media are correct
- Instruction in proper disposal of the facepiece and cartridges
- Instruction in how to recognize and cope with emergencies
- As applicable, instruction for special respirator use (e.g., in emergency procedures, and the use of emergency escape devices, special respirators and air suits)
- Regulations concerning respirator use
- Importance of respirator wearers informing supervisors of any problems experiened by them or their coworkers while wearing respirators
- The need for a successful completion of a fit-test

8.7 Hazardous Material Monitoring

DOE Order 450.1[5] requires each DOE site to conduct environmental sampling and monitoring to prevent the spread of hazardous materials both internal and external to the facility. DOE/WIPP 99-2194, *Waste Isolation Pilot Plant Environmental Monitoring Plan*,[17] implements this Order at the WIPP site. The internal monitoring program, includes controls for hazardous chemicals/materials. Hazardous materials and chemicals are controlled through procedures addressing inventory control, material screening, material accountability, and labeling. Environmental monitoring is conducted throughout the year and the analytical data is reported in the annual site environmental reports (current report is DOE/WIPP 05-2225, *Waste Isolation Pilot Plant 2004 Annual Site Environmental Report*).[18]

8.7.1 Volatile Organic Compound Monitoring

The airborne emission of volatile organic compounds (VOCs) is the only credible release pathway from the WIPP during disposal operations, and the final closure design basis requires this pathway to be eliminated upon final closure.

A baseline VOC monitoring program was conducted at the WIPP and the results of the baseline program were used, in part, to define the confirmatory monitoring program for the disposal phase. VOC monitoring will be conducted throughout the disposal phase of operations to determine VOC concentrations attributed to open and closed panels. WP 12–VC. 02, Quality Assurance Project Plan for Confirmatory Volatile Organic Compound Monitoring,[19] describes a sampling and analysis program to confirm the theoretical calculations. The VOC monitoring program quantifies VOC concentrations in the ambient mine air at the WIPP and addresses the following elements:

1. Rationale for the design of the monitoring program, based on:
   - Possible airborne pathways from the WIPP during the active life of the facility.
   - VOC sampling operations at the WIPP.
   - Optimum location of the ambient mine air monitoring stations to confirm theoretical calculations.
2. Descriptions of the specific elements of the monitoring program including:
   - The type of monitoring conducted.
   - The location of the monitoring stations
   - The monitoring frequency
   - The specific hazardous constituents monitored
   - The implementation schedule for the monitoring program
   - The equipment used at the monitoring stations
   - The sampling and analytical techniques used
   - Data recording and reporting procedures

Sampling in the underground for target VOC compounds, as listed in Table 8.1, takes place at two locations designated as air monitoring stations VOC-A and VOC-B. VOC-B samples for VOCs in the upstream sources (inlet ventilation air to TRU waste disposal panels) and VOC-A samples the underground exhaust air which is the total of VOCs from upstream sources plus any VOC releases from

emplaced TRU waste. Confirmatory VOC sampling began with initial RH waste emplacement in future Panels. Some sampling, however, was conducted prior to waste disposal to evaluate the monitoring system. For each quantified target VOC, the concentrations measured at Station VOC-B are subtracted from the concentrations measured at Station VOC-A to assess the magnitude of VOC releases, if any, from the emplaced waste.

Table 8-1 lists the maximum public exposure concentration at the site boundary from VOC air emissions from both the WHB and the underground. As shown in the table, the total risk from contributions from all nine VOC emissions is considerably less than the acceptable risk level.

Monitoring is performed using pressurized sample collection in stainless steel canisters described in the EPA Compendium Method TO-14A, *Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas*.[20] The TO-14A[20] sampling concept uses six-liter passivated stainless-steel canisters to collect integrated air samples at each sample location. This conceptual method is used as a reference for collecting the samples at the WIPP.

The VOC monitoring program is run under WP 12–VC. 02,[19] that has been prepared in accordance with *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*, EPA QA/R-5.[21] Quality criteria for the target analytes are presented in Attachment N of Hazardous Waste Facility Permit.[22] Definitions of the criteria are given in Attachment N, along with a discussion of other aspects of the quality assurance program, including sample handling, calibration, analytical procedures, data reduction, validation and reporting, performance and system audits, preventive maintenance, and corrective actions.

8.7.2 Meteorological Monitoring

The meteorological monitoring program at the WIPP is performed in accordance with WP 02-EM.01, WIPP Meteorological Quality Assurance Plan,[23] which was written using guidance contained in EPA-454/R-99-005, *Meteorological Monitoring Guidance for Regulatory Modeling Applications*.[24] Meteorological data is monitored and recorded to supplement characterization of the local environment and facilitate the interpretation of data from other environmental monitoring activities at the WIPP.

8.7.3 Nonradioactive Air Contaminants Monitoring

WP 12-IH.02-1, WIPP IH Program - Hazard Assessment,[25] implements the WIPP air quality monitoring program. To ensure compliance with American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV), administrative or engineering controls are determined and implemented whenever possible. When such conditions are not feasible to achieve full compliance, protective equipment and/or protective measures are used to keep employee exposures to air contaminants within prescribed limits. Any equipment and/or technical measures used must be approved by IS&H personnel.

8.7.4 Diesel Emissions Monitoring

Vehicle emissions of underground equipment are periodically monitored in accordance with WP 12-IH.02[9] to assure the health and safety of personnel. Incomplete combustion of diesel fuels causes contaminants of carbon monoxide, carbon dioxide, and nitrogen dioxide. The air in the underground is periodically monitored for these contaminants, to ensure compliance within TLV limits. Vehicles are checked for carbon monoxide and nitrogen dioxide emissions after preventive maintenance checks and during scheduled overview inspections.

8.7.5 Workplace Monitoring

Periodic and unscheduled surveys and inspections are performed by IS&H in accordance with WP 12-IH.02[9] to identify any actual or potential hazards, problems, or undesirable conditions that could adversely impact facility workers in the workplace. Examples of items surveyed are drinking water potability; local exhaust ventilation systems; and chemical, physical, and biological hazards. Sampling of the environment involves calibration of equipment, actual sampling, and recording the results in terms of the actual impact to the worker.

8.8 Hazardous Material Protection Instrumentation

WP 12-IH1006, Airborne Contaminant Sampling,[26] details methods used for collection of airborne contaminant samples to determine employee exposure. Industrial Hygiene has the responsibility to sample airborne contaminants. When necessary, IS&H monitors or tests the air in areas where hazardous chemicals are stored, and in areas where workers may be exposed to concentrations of airborne fumes, mists, or vapors. Surveys are recorded; records contain the location, time, job description, or occurrences that may be associated with the contaminants and instruments used. Chemical inventories, reports and monitoring data are available to Health Services personnel for use in the medical monitoring program.

In the underground, airborne concentrations of mists, fumes, or vapors are monitored and sampled as needed, or upon request, by suitable devices such as Draeger pumps or other portable direct reading instruments. If relevant air concentrations are found in excess of the TLVs, immediate corrective actions will be taken as determined by IS&H, and the air will be periodically tested until in compliance.

Air quality monitoring equipment is calibrated in accordance with manufacturers' recommendations, with an accurate record kept of pre-calibration conditions of the instrument. Functional tests are performed daily. Competency of individuals required to use air monitoring equipment is verified. Functional testing competency requires a formal training program. The selection and placement criteria for technical equipment, types of detectors, and monitors are determined by Industrial Hygiene as defined in WP 12-IH1006.[26] Chapter 10 of this DSA discusses the procedure for the control and calibration of test equipment, the functional testing programs and the maintenance programs for technical equipment.

8.9 Hazardous Material Protection Record Keeping

WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description,[27] defines record keeping requirements at the WIPP. Records are specified, prepared, reviewed, approved, controlled, and maintained to accurately reflect completed work and facility conditions and to comply with statutory or contractual requirements. WP 15-PR3002, Records, Filing, Inventorying, Scheduling, and Dispositioning,[28] and associated procedures ensure that records are reviewed for adequacy, approved for release by authorized personnel, and distributed to and used at the locations where required.

Hazardous materials inventories will be initiated by IS&H and conducted by the HMAR designated by the responsible manager for the area in which the hazardous materials are to be stored and used. A quarterly inventory report will be prepared by IS&H based on input from HMARs from each affected area. The information is then used by Site Environmental Compliance to develop an annual inventory report to satisfy federal environmental reporting requirements.

8.10 Hazard Communication Program

The requirements for hazard communication are set forth in 29 CFR §1910.1200.[12] The WIPP hazard communication program is defined in detail in WP 12-IH.02.[9] Section 8.6.1 of this chapter and discusses hazard communication training for all employees and subcontractors.

The *OSHA Hazard Communication Standard* applies to hazardous chemicals procured and generated in the workplace and/or laboratories; consumer products used in janitorial activities; and pure chemicals associated with the treatment, storage, and disposal at RCRA facilities.[12]

Training on the *OSHA Hazard Communication Standard* is a requirement of all personnel who work with or enter areas where hazardous materials are used. Training of employees is discussed further in Chapter 10 of this DSA.

8.11 Occupational Chemical Exposures

The primary occupational, nonradiological hazard to both the worker and the public during normal operations is from the airborne release of diesel fuel exhaust. Occupational exposures to VOCs and other hazardous materials at the WIPP site do not constitute a concern. Monitoring results for VOCs are discussed in Section 8.7.1 of this chapter.

References for Chapter 8

1. 29 CFR Parts 1900-1999, Occupational Safety and Health Act, July 2004.
2. 29 CFR Part 1926.1, "Safety and Health Regulations for Construction," July 2004.
3. 10 CFR Part 850, “Chronic Beryllium Disease Prevention Program”
4. DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, March 1998.
5. DOE Order 450.1, Change 1, *Environmental Protection Program*, January 2005.
6. DOE Order 5480.4, Change 4, *Environmental Protection, Safety, and Health Protection Standards*, January 1993.
7. WP 12-IS.01-1, Industrial Safety Program - Structure and Management.
8. WP 12-IH.02-9, WIPP Industrial Hygiene Program - Beryllium Exposure Prevention Program
9. WP 12-IH.02, WIPP Industrial Industrial Hygiene Program Manual - Overview.
10. WP 12-IH.02-4, Hazard Communication & Hazardous Material Management Plan.
11. WP 12-2, WIPP ALARA Program Manual.
12. 29 CFR §1910.1200, "Hazard Communications," July 2004.
13. WP 15-HS.02, Occupational Health Program Plan.
14. 29 CFR §1910.1020, "Access to Employee Exposure Medical Records," July 2004.
15. MP 1.28, Integrated Safety Management.
16. WP 12-IH.02-6, Respiratory Protection.
17. DOE/WIPP 99-2194, *Waste Isolation Pilot Plant Environmental Monitoring Plan*.
18. DOE/WIPP 05-2225, *Waste Isolation Pilot Plant 2004 Annual Site Environmental Report*.
19. WP 12-VC.02, Quality Assurance Project Plan for Confirmatory Volatile Organic Compound Monitoring.
20. TO-14A, *Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis by Gas*.
21. EPA QA/R-5, *EPA Requirements for Quality Assurance Project Plans*, Washington, DC, 1994.
22. Hazardous Waste Facility Permit No. NM4890139088-TSDF, issued by the New Mexico Environment Department.

23. WP 02-EM.01, WIPP Meteorological Quality Assurance Plan.

24. EPA-454/R-99-005, *Meteorological Monitoring Guidance for Regulatory Modeling Applications*, U.S. Environmental Protection Agency, Washington, DC, 2000.

25. WP 12-IH.02-1, WIPP IH Program - Hazard Assessment.

26. WP 12-IH1006, Airborne Contaminant Sampling.

27. WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description.

28. WP 15-PR3002, Records, Filing, Inventorying, Scheduling, and Dispositioning.

Table 8-1, Maximum Occupational and Public Exposure From Underground Waste VOC Emissions

Indicator Volatile Organic Compounds	Worker Receptor Concentration (ppmv)		Applicable Exposure Standard ACGIH TLV[c] (ppmv)	Estimated Risk for Carcinogens and Hazard Quotients for Non-Carcinogens for Public Exposure to Waste Emissions	Acceptable Level of Risk [e]
	Surface	Underground			
Carbon Tetrachloride	3.0E-04	1.2E-02	10	3E-08	1E-06
Chlorobenezene [a]	6.9E-04	2.9E-02	75	4E-06[d]	1
Chloroform	2.7E-04	1.0E-02	50[b]	2E-09	1E-06
1,1-Dichloroethylene	1.2E-03	4.7E-02	5	2E-09	1E-05
1,2-Dichloroethane	3.8E-04	1.5E-01	50	8E-10	1E-06
Methylene Chloride	4.5E-03	1.6E-02	25	6E-10	1E-06
1,1,2,2-Tetrachloroethane	3.2E-04	1.3E-02	5	3E-09	1E-05
Toluene [a]	1.6E-03	6.7E-02	200	3E-07[d]	1
1,1,1-Trichloroethane	4.0E-03	1.6E-01	350	2E-08	1E-05

a. Non-carcinogen (all others are class B2 or C carcinogens)
b. Ceiling value limit not to be exceeded
c. Equivalent to or less than applicable OSHA PEL
d. Non-carcinogen hazard quotient
e. Acceptable level of risk for carcinogens is the probability of developing cancer, and for non-carcinogens is a hazard quotient less than or equal to 1